Automation tools for Systematic Reviews

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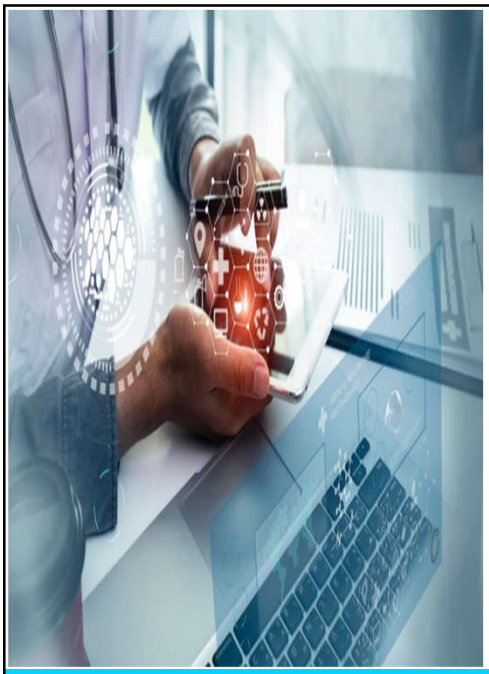

Introduction

❖ Systematic Review is a methodical and comprehensive approach to synthesizing research evidence.

❖ ***Challenges in Traditional SRs:***

✓ *Time-consuming, labor-intensive, and prone to human error.*

❖***Role of Automation:***

✓ *Tools to streamline the process, improve efficiency, and reduce bias.*

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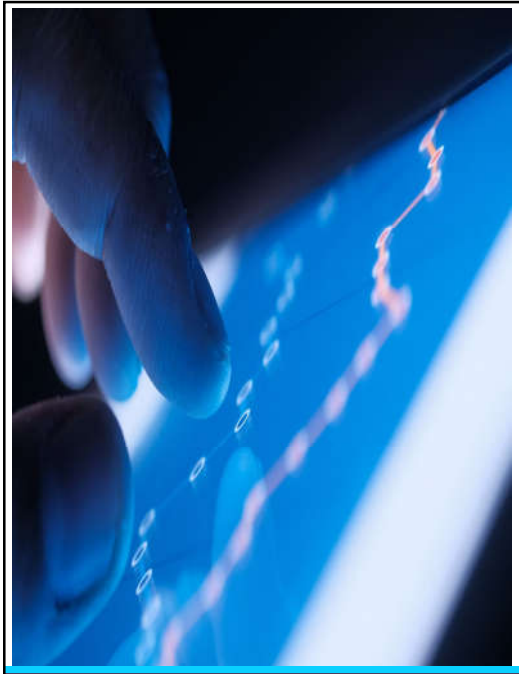

Introduction

- Some researchers have estimated that it takes on average around 11 months to complete a systematic review

VS

- A full systematic review was completed in 2 weeks using automation tools
  - *According to Clark J., et al. (2020)*

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ELSEVIER

Journal of Clinical Epidemiology 121 (2020) 81–90

Journal of Clinical Epidemiology

ORIGINAL ARTICLE

A full systematic review was completed in 2 weeks using automation tools: a case study

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Accepted 18 January 2020; Published online 28 January 2020

Abstract

Background and Objectives: Systematic reviews (SRs) are time and resource intensive, requiring approximately 1 year from protocol registration to submission for publication. Our aim was to describe the process, facilitators, and barriers to completing the first 2-week full SR.

Study Design and Setting: We systematically reviewed evidence of the impact of increased fluid intake, on urinary tract infection (UTI) recurrence, in individuals at risk for UTIs. The review was conducted by experienced systematic reviewers with complementary skills (two researcher clinicians, an information specialist, and an epidemiologist), using Systematic Review Automation tools, and blocked off time for the duration of the project. The outcomes were time to complete the SR, time to complete individual SR tasks, facilitators and barriers to progress, and peer reviewer feedback on the SR manuscript. Times to completion were analyzed quantitatively (minutes and calendar days); facilitators and barriers were mapped onto the Theoretical Domains Framework; and peer reviewer feedback was analyzed quantitatively and narratively.

Results: The SR was completed in 61 person-hours (9 workdays; 12 calendar days); accepted version of the manuscript required 71 person-hours. Individual SR tasks ranged from 16 person-minutes (deduplication of search results) to 461 person-minutes (data extraction). The least time-consuming SR tasks were obtaining full-texts, searches, citation analysis, data synthesis, and deduplication. The most time-consuming tasks were data extraction, write-up, abstract screening, full-text screening, and risk of bias. Facilitators and barriers mapped onto the following domains: knowledge; skills; memory, attention, and decision process; environmental context and resources; and technology and infrastructure. Two sets of peer reviewer feedback were received on the manuscript: the first included 34 comments requesting changes, 17 changes were made, requiring 173 person-minutes; the second requested 13 changes, and eight were made, requiring 121 person-minutes.

Conclusion: A small and experienced systematic reviewer team using Systematic Review Automation tools who have protected time to focus solely on the SR can complete a moderately sized SR in 2 weeks. © 2020 Elsevier Inc. All rights reserved.

Keywords: Systematic reviews; Automation; Methods improvement; 2 week systematic review; 2wSR; Systematic review accelerator; Barriers; Facilitators

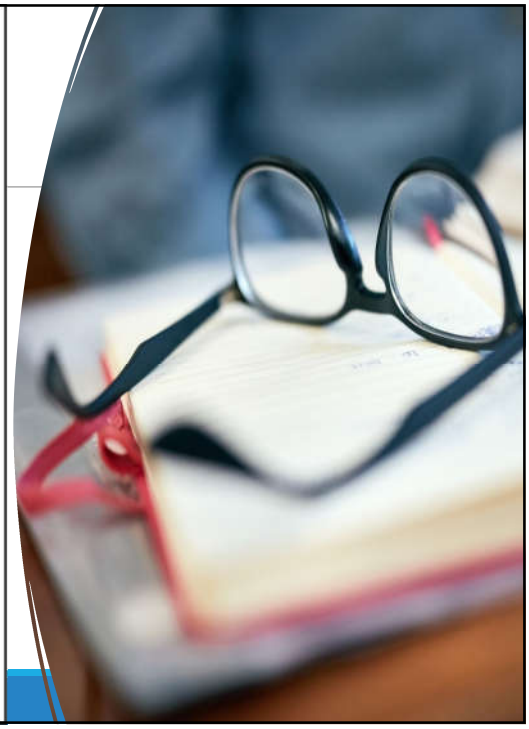
1. Background

Systematic reviews (SRs) synthesize evidence to answer a specific question, using methods that are transparent and reproducible. They are considered the highest-level of evidence to underpin clinical and policy decisions.

Funding: The systematic review described in the manuscript was conducted as part of the work of the Centre of Research Excellence in Minimising Antibiotic Resistance in the Community (CRE-MARC), funded by the Na-

However, SRs are time and resource intensive, requiring a median of five researchers and 41 weeks to submit to a journal [personal communication, Kathryn Kaiser; [1]]. A median-sized SR search yields 1,781 references (range: 27–92,020) and requires a title/abstract screen of 1,286 references (range 14–77,910) and a full-text screen of 63 references (range: 0–4385). A median-sized SR includes 15 studies (range: 0–291) [1].

The International Collaboration for the Automation of



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What are Automated Systematic Review Tools?

- Software or platforms that use AI, machine learning, or natural language processing to assist in various stages of systematic reviews.

- **Key Benefits:**
  - Faster screening, data extraction, and synthesis
  - Improved accuracy and reproducibility

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Automated SR Tools

Automation of systematic reviews in order to simplify the process of producing reviews

The uptake of automation of systematic reviews has been relatively slow

A fully automated process is still not providing an acceptable performance compared with human reviewers

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Automatic SR tools categories

- **Visualization tools**
- tools that use **active learning** — *combination of a Natural Language Processing (NLP), machine learning, and human involvement*
- **Automated tools** — *employ an NLP and classifier but they use labelled documents and no human interaction during the learning process*
- Most tools in this area are semi-automated and still require human intervention to train them, to achieve an acceptable performance

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Automatic SR tools categories

- **Screening Tools** — *Example: Rayyan, Abstrackr*
- **Data Extraction Tools** — *Example: Covidence, SUMARI*
- **Synthesis Tools** — *Example: EPPI-Reviewer, RevMan, SUMARI*
- **End-to-End Platforms** — *Cover all stages of the systematic review process* — *Example: Covidence, DistillerSR, SysRev*

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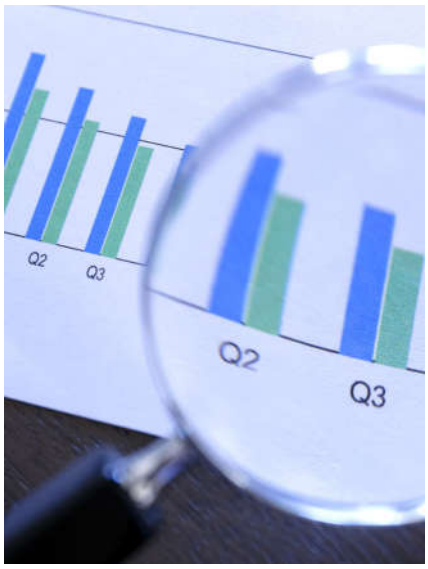

Based on a scoping review *(Khalil et al, 2022)*:

- Abstract screening has reached maturity
- Data extraction is still an active area

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	Covidence	Sumari	Rayyan	SR-Accelerator
Protocol Development	✗	✓	✗	✓
Search Improvement	✗	✗	✗	✓
Duplicate removal	✓	✓	✓	✓
Article Screening	✓	✓	✓	✓
Critical Appraisal	✓	✓	✗	✗
Synthesis	✗	✓	✗	✗
Assists with reporting	✓	✓	✗	✓
Cost	Subscription	Subscription	Free + ($)	Free

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Systematic Review Toolbox

- The Systematic Review Toolbox is an **online catalogue of tools that support various tasks** within the systematic review and wider evidence synthesis process
- Developers: Dr Christopher Marshall and Anthea Sutton
- Supported and hosted by the NIHR Innovation Observatory
- Link: https://systematicreviewtools.com/
- 2014

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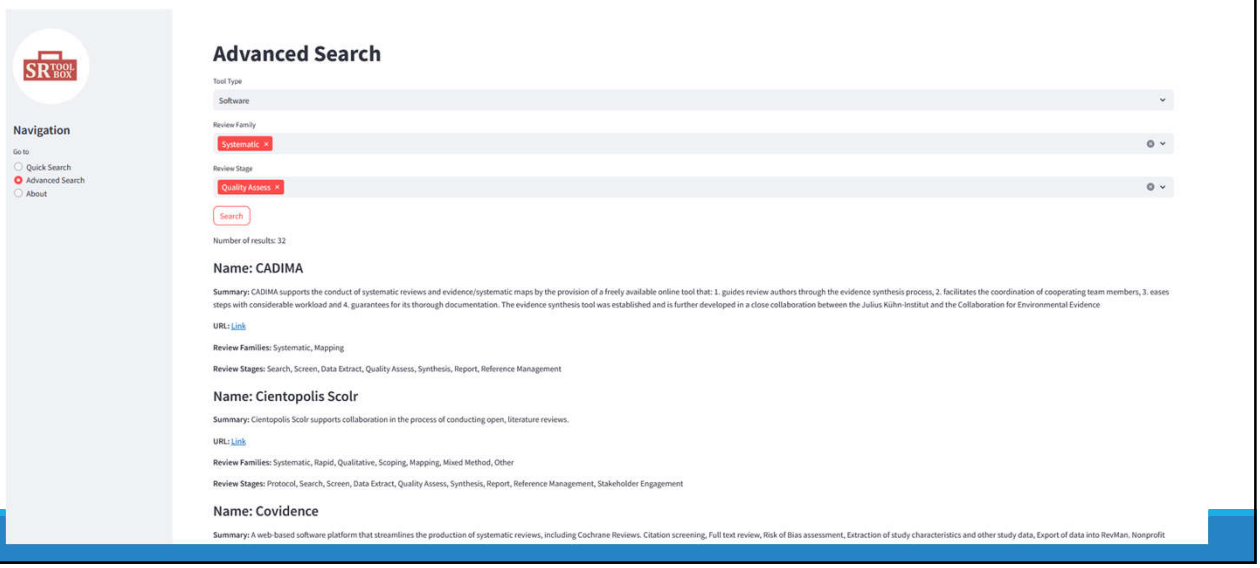
Systematic Review Toolbox



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SRA tools

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Systematic Review Accelerator

- A free software
- developed at Bond University
- speed up translation of searches from PubMed/Ovid MEDLINE
- URL: https://sr-accelerator.com/
- **Review Families:** Systematic
- **Review Stages:** Protocol, Search, Screen, Reference Management

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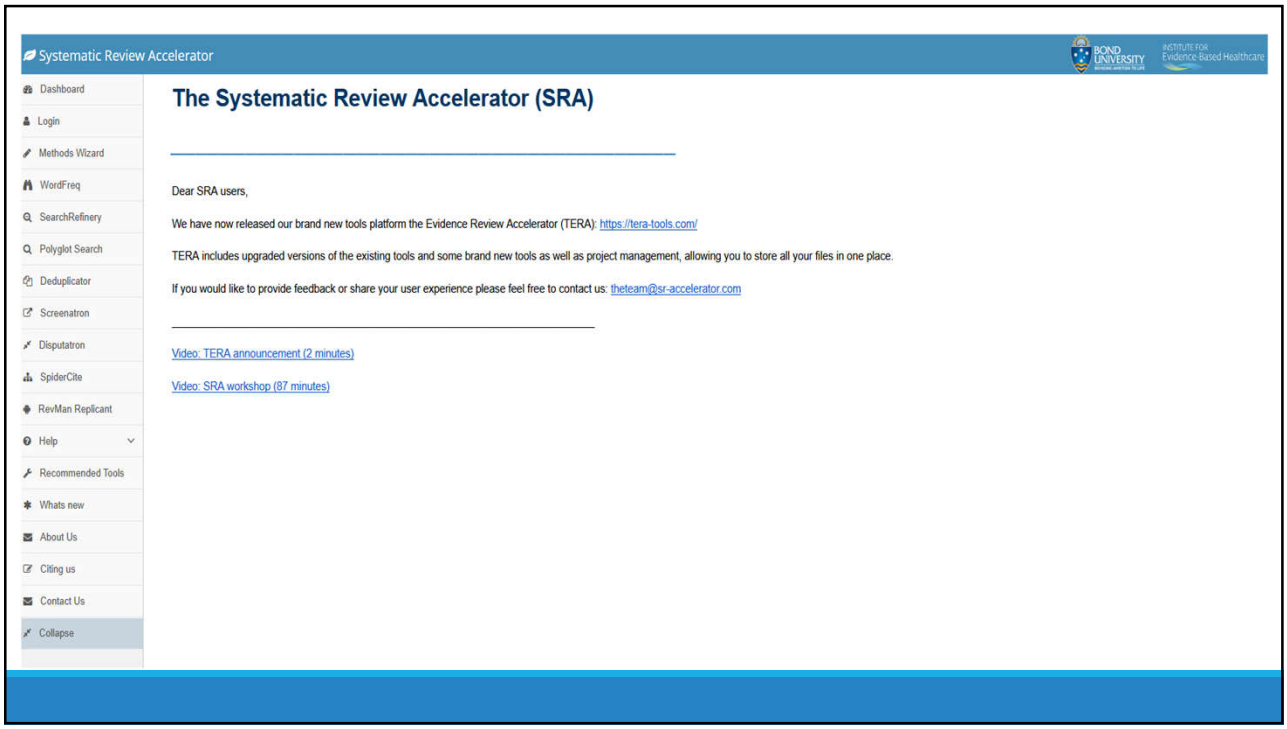

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Rayyan

rayyan

- Web based, collaborative application to support undertaking systematic reviews
- Includes a mobile app for screening studies on the go
- URL: https://www.rayyan.ai/
- **Review Families:** Systematic, Rapid, Qualitative, Scoping, Mapping, Mixed Method, Other
- **Review Stages:** Screen

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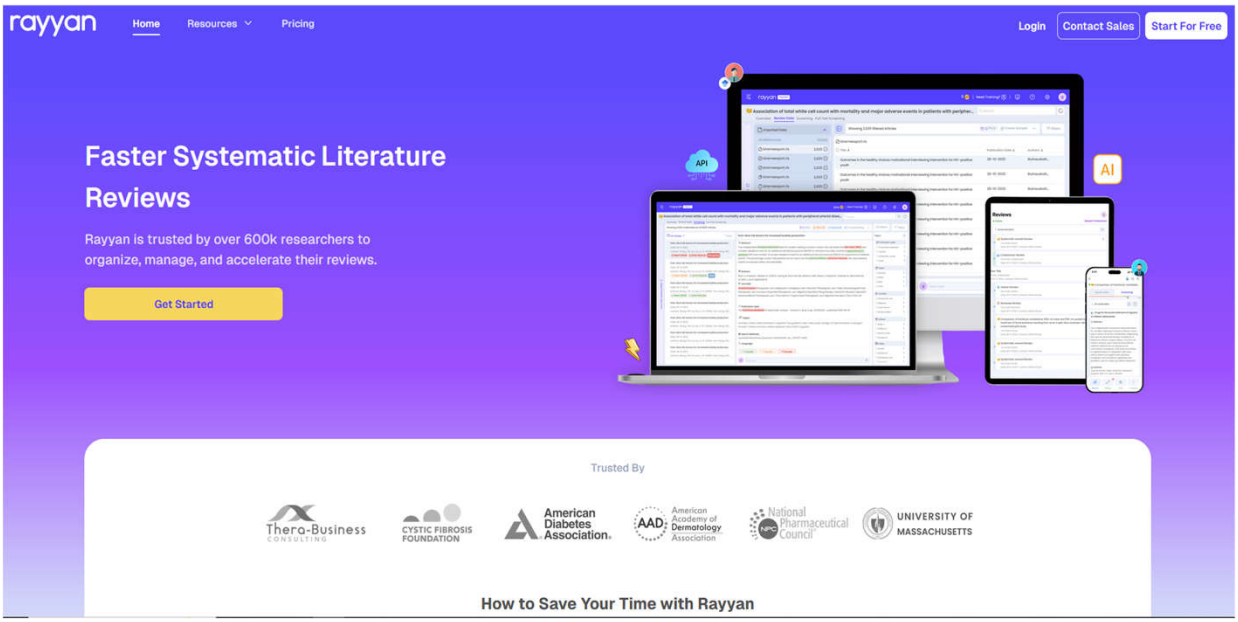

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Sumari

JBI SUMARI

- A System for the Unified Management, Assessment and Review of Information
- containing a suite of tools to support various aspects of the systematic review process
- developed at the Joanna Briggs Institute (JBI)
- URL: https://sumari.jbi.global/
- **Review Families:** Systematic, Rapid, Qualitative, Scoping, Mapping, Mixed Method, Other
- **Review Stages:** Protocol, Screen, Data Extract, Quality Assess, Synthesis, Report, Reference Management

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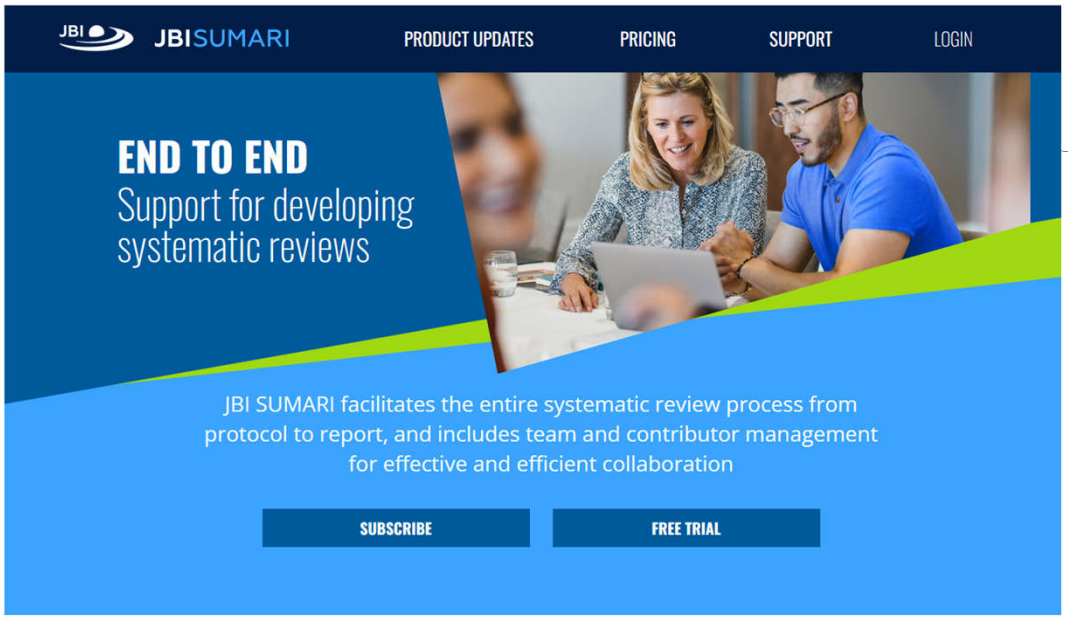

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Covidence

- A web-based software
- Support Cochrane Reviews
- Nonprofit organization, open source software
- URL: https://www.covidence.org/
- **Review Families:** Systematic, Rapid, Mixed Method
- **Review Stages:** Screen, Data Extract, Quality Assess

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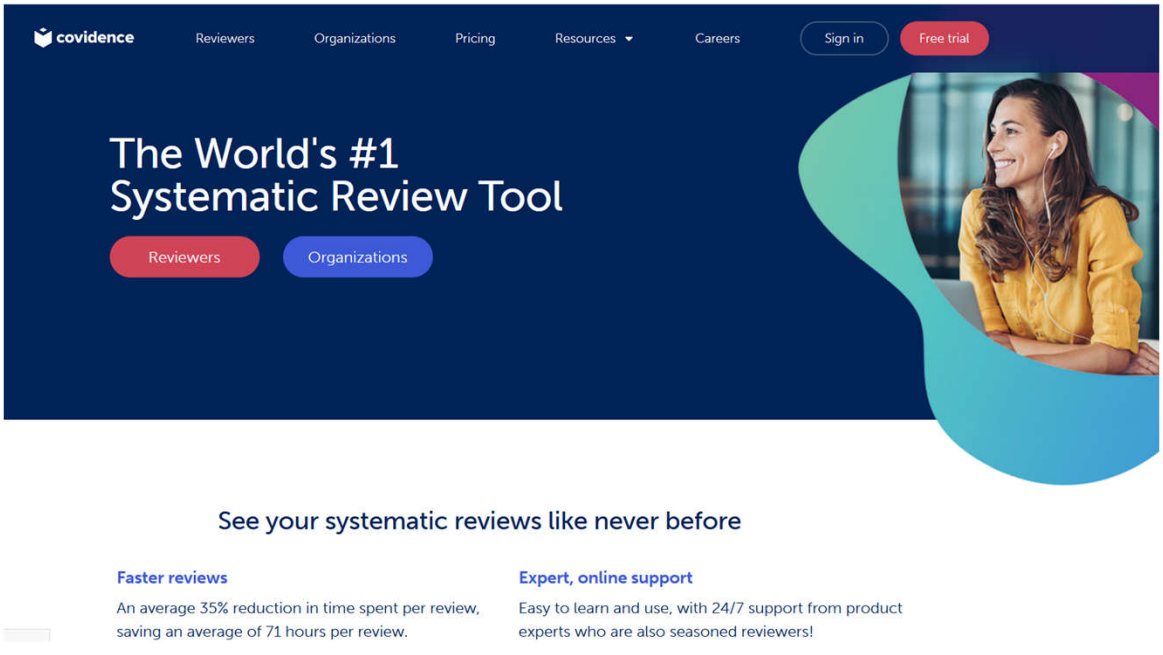

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EPPI-Reviewer

- Web-based tool
- Match with EPPI-Mapper
- URL: http://eppi.ioe.ac.uk/cms/Default.aspx?tabid=3396
- **Review Families:** Systematic, Rapid, Scoping, Mapping, Other
- **Review Stages:** Screen, Data Extract, Synthesis

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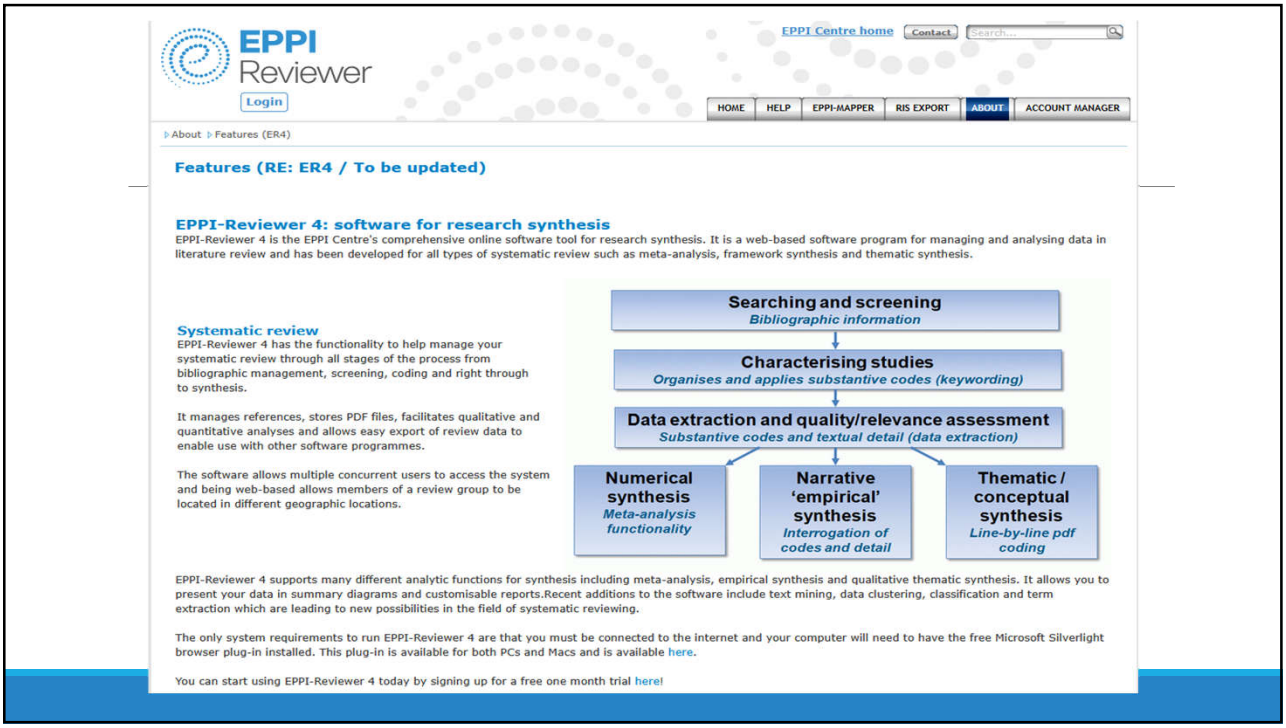

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Abstrackr

- An online tool for the task of citation screening for systematic reviews
- URL: http://abstrackr.cebm.brown.edu/account/login
- **Review Families:** Systematic, Rapid, Scoping, Mapping, Mixed Method
- **Review Stages:** Screen

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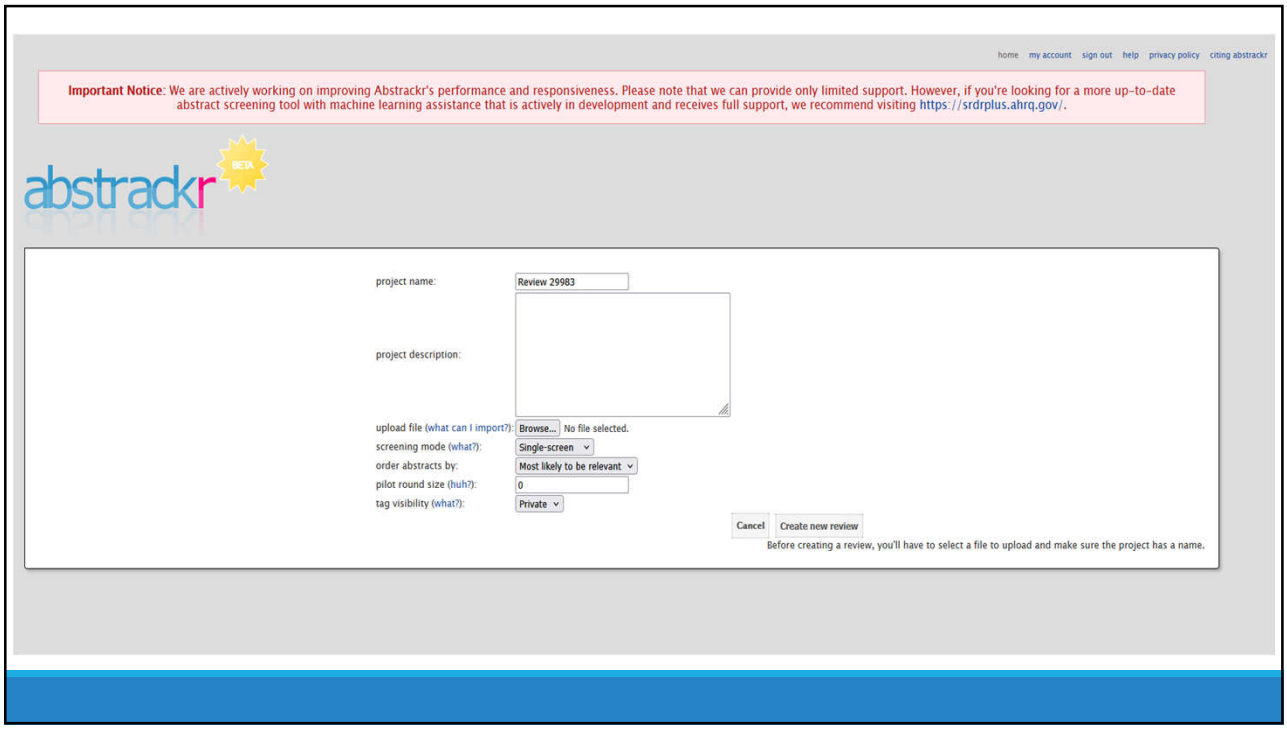

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DistillerSR

DistillerSR

- Web-based tool
- AI-enabled literature review automation and enterprise evidence management software
- URL: https://www.distillersr.com/
- **Review Families:** Systematic, Rapid, Scoping, Mixed Method, Other
- **Review Stages:** Protocol, Screen, Data Extract, Quality Assess, Synthesis, Report, Reference Management

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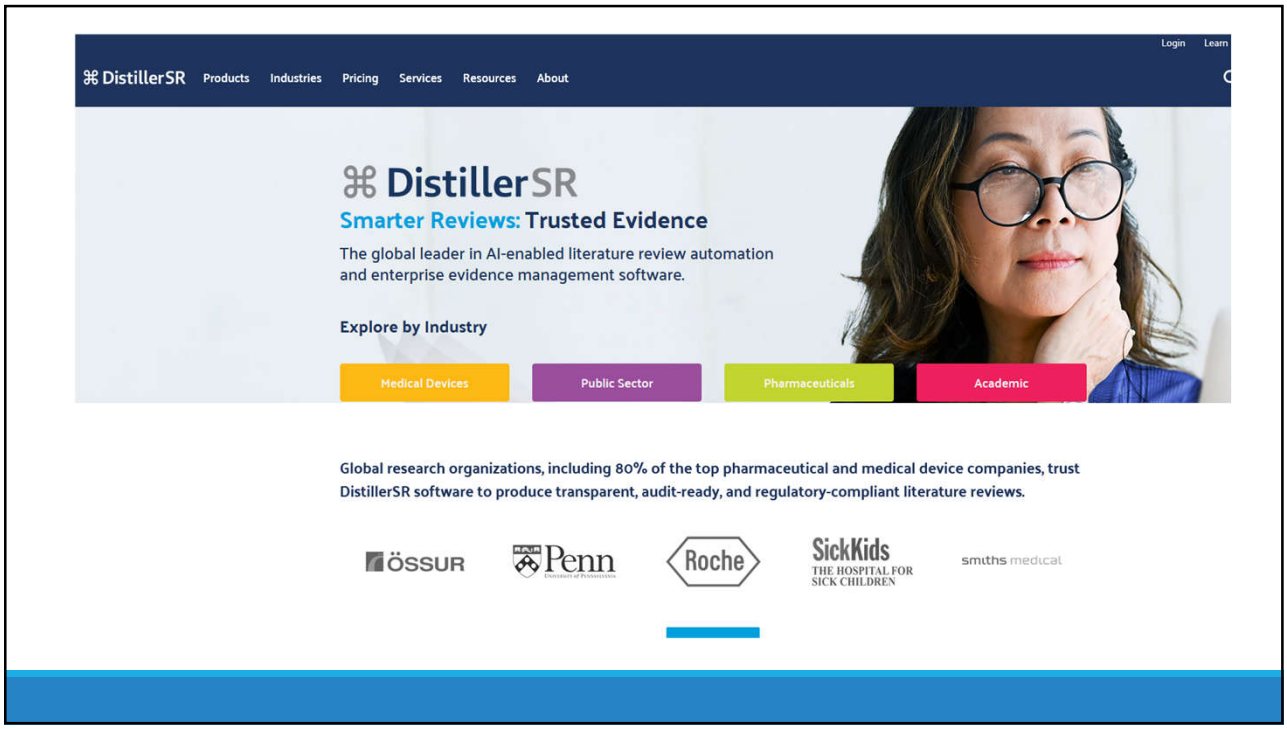
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